

U.S. Patent Application Serial No. 10/520,272
Amendment filed March 12, 2007
Reply to OA dated December 11, 2006

REMARKS

Claims 1-2, 4-7 and 9-10 are pending, with claims 3, 8, 11 and 12 being cancelled.

The support for the amendments to the claims are as follows: Claims 1 and 7: (p.6, lines 24 and 29; p.7, lines 1-7); Claims 4 and 9:(correct spelling error); and Claims 5 and 10: (p.8, line 6). The applicants respectfully submit that no new matter has been added. It is believed that this Amendment is fully responsive to the Office Action dated December 11, 2006.

As for claims 5 and 10, the term "1,1,1,3,4,4,5-nonafluoro-2-pentene" occurring in the claims is an error and is corrected to "1,1,1,3,4,4,5,5,5-nonafluoro-2-pentene"as supported in the specification on page 8, line 6.

Claim 1 is objected to because of the following formalities: The use of the phrase "characterized" is not in compliance with US practice.

Claim 1 has been amended to overcome this rejection by using proper process claim language.

Claims 1-10 are rejected under 35 USC 103(a) as being unpatentable over Sato et al. (6,270,948) in view of Hung (6,544,429) as evidenced with Sievert et al. (US 6,147,267).

The combination of references is **limited to disclosing only a single fluorine containing etching gas compound having a triple bond, namely perfluro-2-butyne**, and does not disclose

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further fluorine containing etching gas compounds as now claimed. With out more disclosure, it is not logically possible for the combination of references to teach or even suggest the invention as now recited in claims 1 and 7.

Sato does disclose irradiating a substrate with a resin film with ArF (wavelength: 193 nm) and Fe (wavelength: 151 nm) (col.72, lines 28-29). Sato also discloses forming a resist pattern having a thickness of 180nm in Examples 20-26, 37 and Comparative Example 8. Sato also discloses that the substrate is etched with fluorine containing gas (Claim 5). However, the rejection admits, on p.3, text lines 12-13 of the Office Action, that Sato fails to teach a fluorine-containing compound having 4 to 6 carbon atoms and at least one unsaturated bond as an etching gas.

Hung discloses:

The use of xenon (Xe) as the diluent gas in fluorine-based oxide etching provides very high selectivity to nitride and a wide process window, especially in combination with heavy fluorocarbons, for example, **hexafluorobutadiene (C₄F₆)**. (Col.6, lines 50-53). (emphasis added)

and

a gas mixture consisting of a first amount of a fluorocarbon selected from the group consisting of hexafluorobutadiene, **hexafluorobutylene**, hexafluorocyclobutene, hexafluorobenzene, octafluorocyclobutane, and octafluoropentadiene and a second amount of xenon (Claim 1) (emphasis added)

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As the Examiner notes on p.4 of the Office Action (text lines 1-3) hexafluorobutylene is the same as perfluoro-2-butyne, as referenced by Sievert, having the formula $\text{CF}_3\text{C}\equiv\text{CCF}_3$.

In light of this, claim 1 and claim 7 are amended to overcome the combination of Sato and Hung. Claim 1 has now been amended to exclude perfluoro-2-butyne as follows:

Claim 1 (Currently Amended): A dry etching method for forming characterized in that a resist film ~~formed~~ on a substrate comprising: is

irradiating a substrate with a resist film formed thereon ~~irradiated~~ with radiation having a wavelength of not more than 195 nm to form a resist pattern having a minimum line width of not more than 200 nm, and

subjecting the substrate having the resist pattern formed thereon ~~is subjected~~ to dry etching using a fluorine-containing compound having 4 to 6 carbon atoms and at least one unsaturated bond selected from the group consisting of a triple bond, a double bond and both a double bond and a triple bond as an etching gas, wherein the fluorine-containing compound having a triple bond is one selected from the group consisting of: perfluoro-1-butyne, perfluoro-1-pentyne, perfluoro-2-pentyne, perfluoro-1,3-pentadiyne, perfluoro-1,4-pentadiyne, perfluoro-1-hexyne, perfluoro-2-hexyne, perfluoro-3-hexyne, perfluoro-1,3-hexadiyne, perfluoro-1,4-hexadiyne, perfluoro-1,5-hexadiyne and perfluoro-2,4-hexadiyne.

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The amended claims do not recite the disclosed perfluoro-2-butyne, but specifically recite other fluorine-containing compounds having 4 to 6 carbon atoms with at least one unsaturated bond, including a triple bond as recited on p.7, lines 1-7 of the specification.

Since the combination of references only discloses or suggests one compound, namely perfluoro-2-butyne, the combination cannot logically suggest all other compounds now claimed.

Claims 1 and 7 are clearly outside the scope of the references and are no longer obvious over their combination.. It is respectfully requested that the rejection be reconsidered and withdrawn.

In view of the aforementioned amendments and accompanying remarks, claims 1-2, 4-7 and 9-10, as amended, are in condition for allowance, which action, at an early date, is requested.

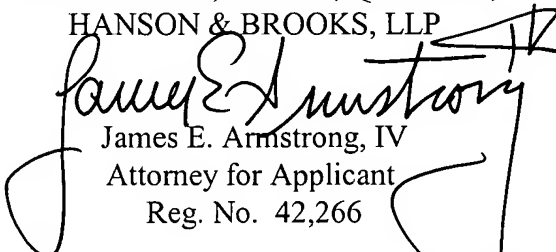
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If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact the applicants undersigned attorney at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed, the applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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